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PARTS LAB
#269

OVERVOLTAGE/OVERCURRENT
PROTECTOR

MODEL VIP 1

SERIAL NO. E-645.27

INSTRUCTION MANUAL

kepco®

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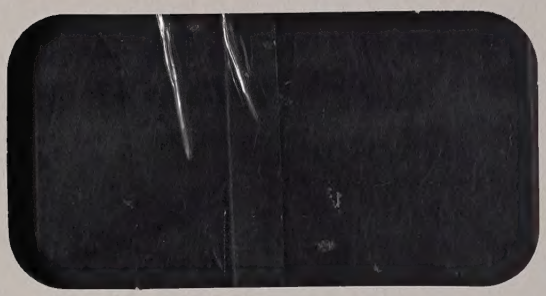

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SECTION I - INTRODUCTION

1-1 SCOPE OF MANUAL

1-2 This instruction manual contains information for the installation, operation and maintenance of the Kepco VIP-1 OVER VOLTAGE/OVER CURRENT PROTECTOR.

1-3 GENERAL DESCRIPTION

1-4 The Kepco Model VIP-1 is an accessory device for connection to DC power supplies to protect external loads from DC over voltage or over currents which can develop as a result of a malfunction in the power supply or in the load circuitry. When the VIP-1 is triggered by an over voltage or over current, it instantaneously "crow-bars" the power supply and operates an internal relay, the contacts of which disconnect the power supply power outlet. Following triggering, the internal relay remains energized until the VIP-1 is re-set by removing the line power from the device. In addition to a visual indicator at the front panel, the VIP-1 is equipped with an alarm outlet at the rear, which is energized with 115 V AC in case of triggering.

1-5 The Model VIP-1 may be connected to operate with any KEPCO power supply whose DC output rating and input power are within the specifications of the VIP-1. Other DC power supplies whose output and input ratings are similary within the rating of the Model VIP-1 and which are capable of withstanding the application of a short circuit may also be used.

1-6 SPECIFICATIONS, ELECTRICAL

a) Voltage Mode

1) Sensitivity: Minimum threshold 1% of operating voltage or 0.1 volts whichever is greater.

2) Range: Adjustable in the range of 5 to 200 volts.

b) Current Mode

1) Sensitivity: 5% of operating current producing a 1 volt drop across an external sensing resistor.

2) Range: 0 to 30 amperes.

c) Response Time

1) Shunting across the output (crow-baring) occurs within 50 μ sec. after triggering.

d) Maximum Input Current of Power Supply: The internal relay contacts switching the power supply outlet are rated for 10 amperes (non-inductive) rms current.

e) Input Power Requirements (VIP-1 only): 105 to 125 V AC or 210 to 250 V AC, approximately 10 watts, 45 to 400 Hz, single phase.

1-7 SPECIFICATIONS, PHYSICAL

a) Dimensions: Height 3 1/2", Width 19", Depth 11" (over-all behind panel)

b) Finish: Light Gray per Federal Standard: 595 Color 26440.

c) Mounting: Panel fits standard 19" rack.

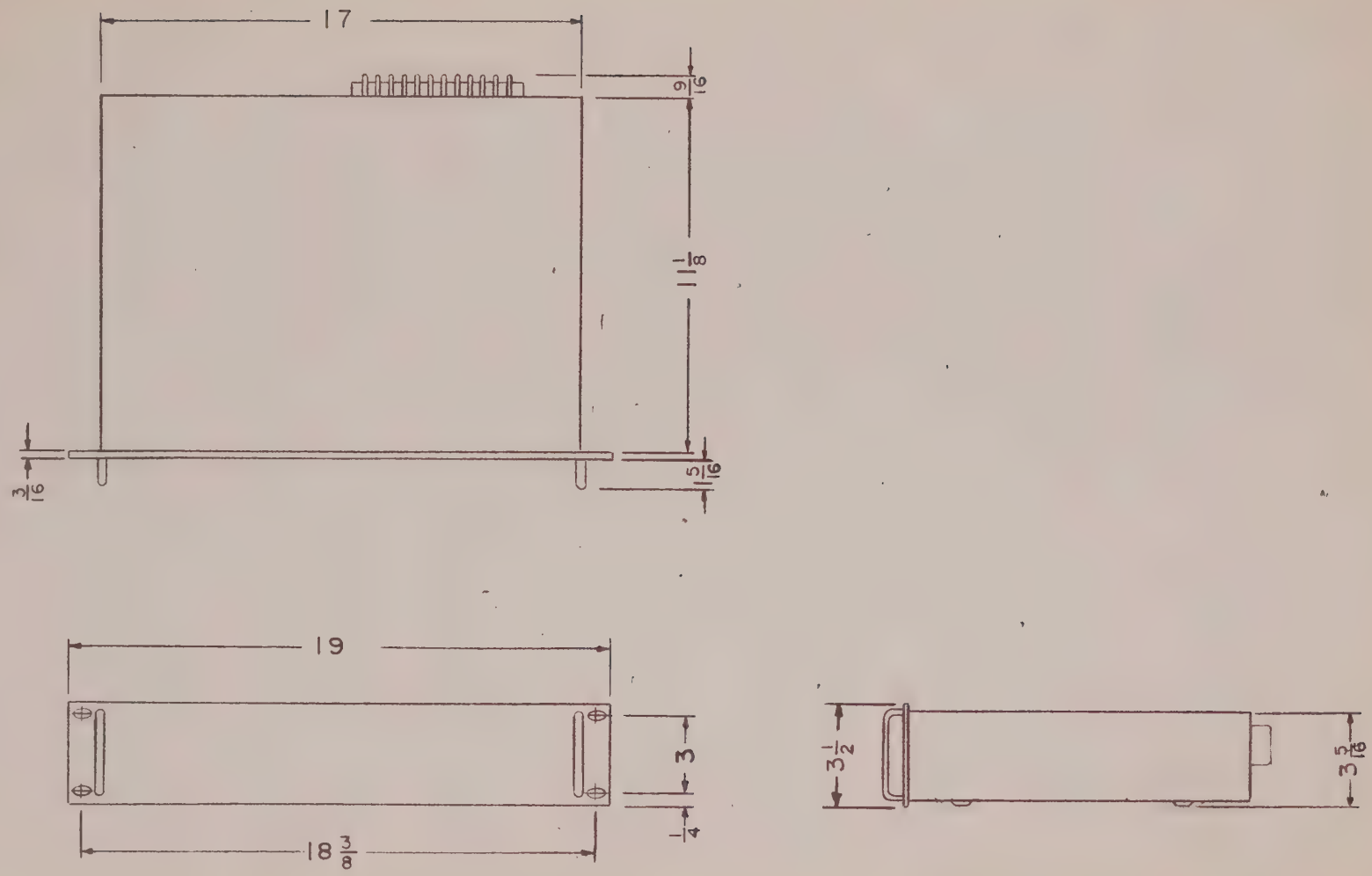


FIG. I-I MECHANICAL OUTLINE.

SECTION II - INSTALLATION

2-1 UNPACKING AND INSPECTION

2-2 The KEPCO Model VIP-1 Overvoltage/Overcurrent Protector has been completely tested and inspected at the factory prior to packing and is ready for installation and operation. It should be unpacked with reasonable care and inspected for shipping damages. Notify the responsible carrier if any evidence of such damage exists.

2-3 TERMINALS AND CONTROLS (Refer to FIG'S 2-1 and 2-2, also TABLES 2-1 and 2-2)

a) FRONT PANEL CONTROLS AND TERMINATIONS

1) POWER SWITCH, "ON-OFF" toggle switch, controlling the input power to the VIP-1 and to the power supply connected to the rear Power Supply AC Power Outlet.

2) FUSE, protects VIP-1 circuitry only. Opening of this fuse, or setting POWER SWITCH (1) to "off" position will also release the internal relay and thereby shut off the connected power supply. (As will any momentary or permanent removal of line power from the VIP-1.)

3) OPERATE LIGHT. White pilot light indicates VIP-1 in OPERATING mode.

4) FAULT LIGHT. Red pilot light indicates fault condition, VIP-1 has triggered. Will remain "on" until cause for fault has been removed and unit has been reset.

5) OPERATING VOLTAGE, 'COARSE'. Control for setting VIP-1 for the operating voltage of the connected power supply, step-switch, four steps of 50 volts each.

6) OPERATING VOLTAGE, 'FINE', Continuous control for setting operating voltage within the four bands of the coarse control.

7) SENSITIVITY, a continuous control for setting the triggering threshold above the set operating voltage.

b) REAR TERMINATIONS

1) REAR BARRIER STRIP. Contains (+) and (-) output terminals, parallel to front terminals, and terminals for special operating procedures. (Refer to Section III of this manual)

2) POWER SUPPLY AC POWER-OUTLET, (Relay controlled)

3) ALARM RECEPTACLE. Outlet for connection of an alarm device. Output is 115 V AC when unit is in FAULT condition. Current carrying ability: 0.25 A, rms non-inductive.

4) INPUT LINE CORD. Three wire safety line cord, supplying AC power to Model VIP-1 and to the connected power supply.

2-4 OPERATION ON OTHER THAN STANDARD POWER LINE

2-5 The Model VIP-1 is normally supplied for operation on a 105 to 125 V AC, 45 to 400 Hz, single phase line. To operate on 210 to 250 V AC, locate transformer T1 (Refer to FIG. 5-2) and remove bare wire jumpers between terminals (1)-(2) and (3)-(4) on the printed circuit board. Connect jumper between terminals (2) and (3). Do not remove any other wires. Proceed in reverse order to reconversion to 105-125 V AC operation.

2-6 GROUNDING

a) AC Ground. The power supply is equipped with a 3 wire safety line cord and polarized plug. The third (green) wire in the line cord is connected to the chassis and the case of the unit. If a two terminal receptacle in combination with an adaptor is used, it is imperative that the chassis of the power supply be returned to AC ground with a separate lead.

b) DC Ground. All DC input terminals are isolated from ground.

NOTE: It is important that the ground potential between the power supply ground and the VIP-1 ground is as small as possible to prevent spurious triggering of the device due to ground pick-up. If possible a common ground lead should be constructed, connecting both units together and then leading to a good ground.

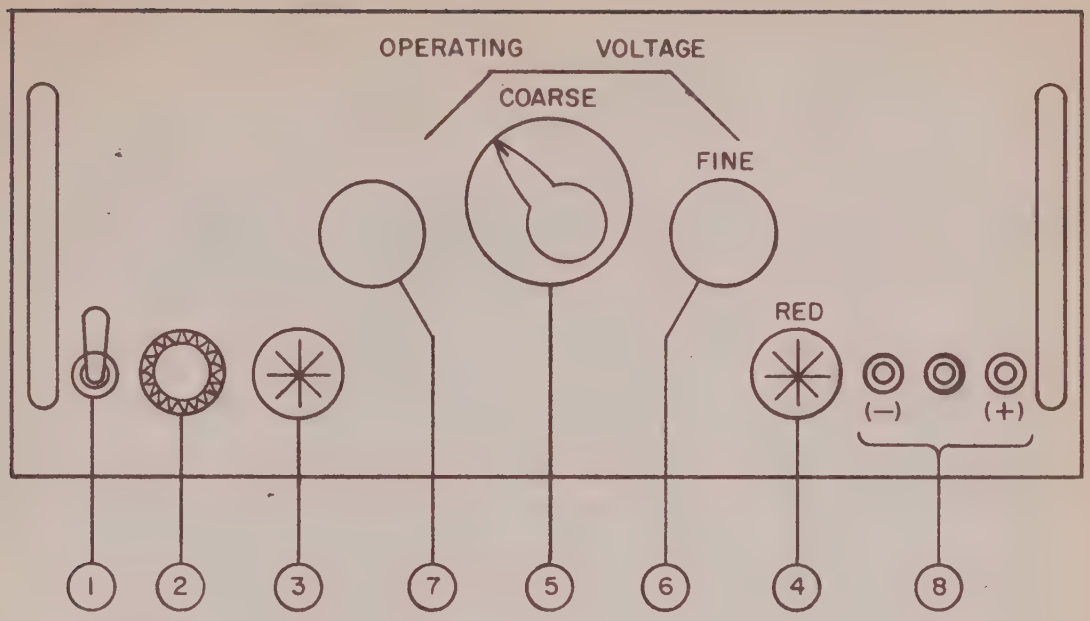


FIG. 2-1 FRONT PANEL TERMINATIONS AND CONTROLS

No.	TERMINAL OR CONTROL (See par. 2-3 for functions)
1	POWER SWITCH
2	FUSE
3	OPERATE PILOT LIGHT
4	FAULT PILOT LIGHT
5	OPERATING VOLTAGE 'COARSE'
6	OPERATING VOLTAGE 'FINE'
7	SENSITIVITY CONTROL
8	OUTPUT TERMINALS

TABLE 2-1, FRONT PANEL TERMINATIONS AND CONTROLS

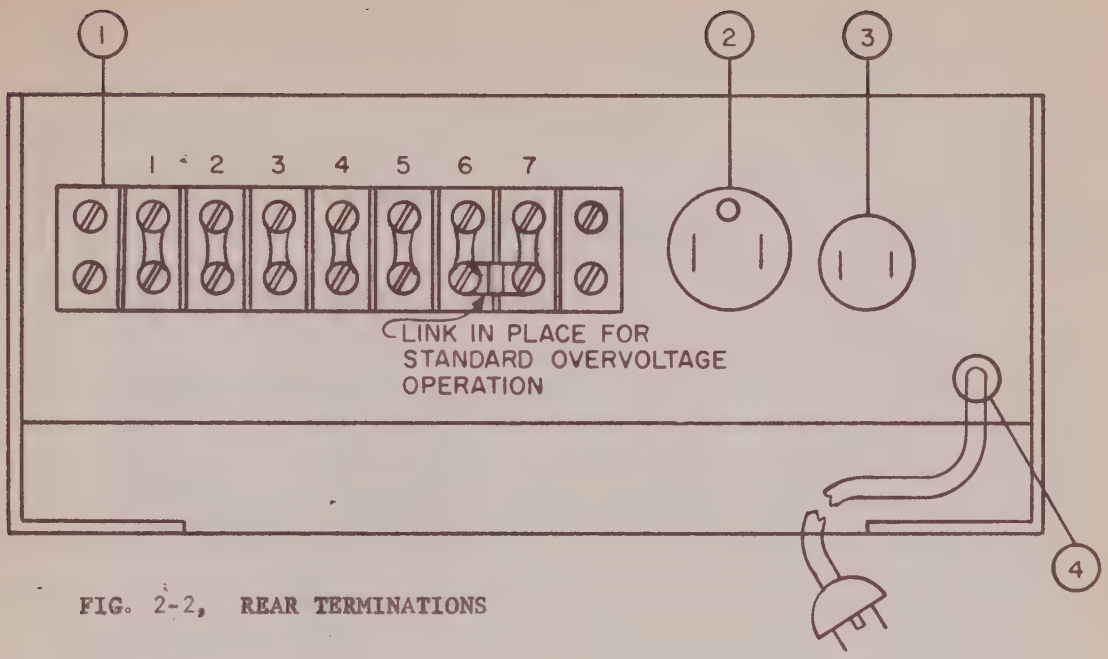


FIG. 2-2, REAR TERMINATIONS

No.	TERMINATION
1	REAR BARRIER STRIP, 7 TERMINALS: (1) (+) Output, connects to (+) power supply output (2) Chassis (Ground) (3) (-) Output, connects to (-) power supply output (4)-(5) No connection (6) Amplifier input, null junction (7) Voltage Control.
2	POWER SUPPLY AC POWER OUTLET (Relay controlled)
3	ALARM OUTLET
4	AC LINE CORD

TABLE 2-2, REAR TERMINATION

SECTION III - OPERATING PROCEDURES

3-1 GENERAL

3-2 The Kepco Model VIP-1 Overvoltage/Overcurrent Protector is shipped with a removable jumper-link between rear barrier strip terminals (6) and (7). This link must be in place and secured tightly for standard over voltage operation of the VIP-1.

3-3 STANDARD OVERVOLTAGE OPERATION

3-4 Description. In this mode of operation, the Model VIP-1 is set to trigger at a pre-selected voltage within its range, chosen to be some value above the intended operating voltage of the power supply. The operation is perhaps best described by means of an example: The desired operating voltage of a power supply is 24 V DC. An over voltage of 2 volts shall crow-bar the power supply.

3-5 PROCEDURE (Refer to FIG. 3-1)

a) Set controls on VIP-1 as follows:

1) AC POWER SWITCH "off"

2) OPERATING VOLTAGE 'COARSE' to position "0-50V"

3) OPERATING VOLTAGE 'FINE', fully clockwise.

4) SENSITIVITY to about 90% of its maximum clockwise position.

b) Connect the operating set-up as shown in FIG. 3-1

c) Turn AC POWER SWITCH "on". The white OPERATE pilot light should be on, the red FAULT pilot light should be out. The power supply should be on if its AC power switch was in the "on" position. IF it was not, turn power supply on.

d) Set power supply to the desired operating voltage plus 2 volt (26V). Slowly turn OPERATING VOLTAGE 'FINE' control counter clockwise until VIP-1 triggers and FAULT pilot light goes on, then back off slightly in clockwise direction from this setting. Turn AC POWER SWITCH off to reset the VIP-1.

e) Turn AC POWER SWITCH on again. If the FAULT light goes out immediately, the setting of the SENSITIVITY is too close and should be turned slightly counter clockwise. Repeat resetting the VIP-1 until FAULT light stays out when power is switched on.

f) Test over voltage point by slowly raising the power supply voltage until the VIP-1 triggers. This completes the set-up procedure. The VIP-1 is now ready to operate.

NOTE: In case of a need for greater sensitivity (smaller over voltage) the setting of the SENSITIVITY control should be increased clockwise. This will necessitate the manual shut down of the power supply before the VIP-1 is reset. After reset, the power supply is switched on after the AC power is applied to the VIP-1.

3-6 TRACKING OPERATION

3-7 Description. In this mode of operation; the VIP-1 is connected directly into the sensing circuit of the power supply and detects error voltages resulting from internal defects of the supply. Any defect, (such as shorted pass transistors) will cause an unbalance of the sensing circuit which, as an error signal will trigger the VIP-1.

3-8 The tracking method is specifically designed for use with Kepco feedback regulated power supplies or units of similar design where the error signal at the sensing circuit terminals is virtually zero at balance and which use the negative terminals as their common lead. (PNP pass-elements)

3-9 PROCEDURE (Refer to FIG. 3-2)

a) Remove links on the rear barrier-strip of the model VIP-1 between terminals (6)-(7). Connect terminal (6) to the null junction of the power supply as shown. Set SENSITIVITY control to its maximum clockwise position.

b) Turn power supply and VIP-1 "on". The operating set up is now complete. Any malfunction in the power supply will trigger the VIP-1 and crow-bar the power supply. To test the operating set-up, proceed as described in par. 3-9C.

c) Open load switch and shut off AC power from both, VIP-1 and the power supply. Connect monitoring voltmeter and another, variable power supply (Supply #2) across the output of the original supply (Supply #1). Turn on VIP-1 and both power supplies. Increase voltage of supply #2 beyond that of supply #1 and note the triggering point of the VIP-1 on the monitoring voltmeter. This point may now be varied from the previous set maximum sensitivity to the threshold level desired.

d) Reconnect load, Remove supply #2. The VIP-1 is now ready to operate.

3-10 OVERCURRENT OPERATION

3-11 Description. In this operating mode the Model VIP-1 senses a small voltage drop across a resistance placed in series with the DC load current which the power supply delivers to the load. The voltage across this "sensing resistor" is proportional to the load current and is used as an error signal to trigger the VIP-1 in event of an over current. The sensing resistor should be of such a value as to drop approximately 0.5 volt at the desired operating current. It should preferably be built as a four terminal network and must have sufficient power rating to exclude thermal drift.

3-12 PROCEDURE (Refer to FIG. 3-3)*

a) Remove links on the rear barrier strip of the model VIP-1 between terminals (6)-(7). Connect operating set-up as shown in FIG. 3-3. Set SENSITIVITY control to its max. clockwise position.

b) Turn on VIP-1 before power supply. Turn on power supply. Rotate OPERATING VOLTAGE 'FINE' control until the red FAULT light goes on. Back off on the OPERATING VOLTAGE 'FINE' control. The VIP-1 is now set up for operation. If the operating set-up is to be tested, proceed as directed in paragraph 3-12C.

c) Connect substitute load and adjust to actual operating current. Connect ampere meter in series with load. Turn on both VIP-1 and power supply (in that order), advance power supply current control to draw a load current beyond the actual operating current. Observe actual triggering point simultaneously on the ammeter and by the energizing of the FAULT light. The SENSITIVITY control may now be varied to the desired cut-out point and re-checked by the procedure just described.

d) Re-connect actual operating load. The Model VIP-1 is now ready for operation.

*Note: In applications where the power supply delivers constant current to the load, error sensing as shown in FIG. 3-3 may be deleted.

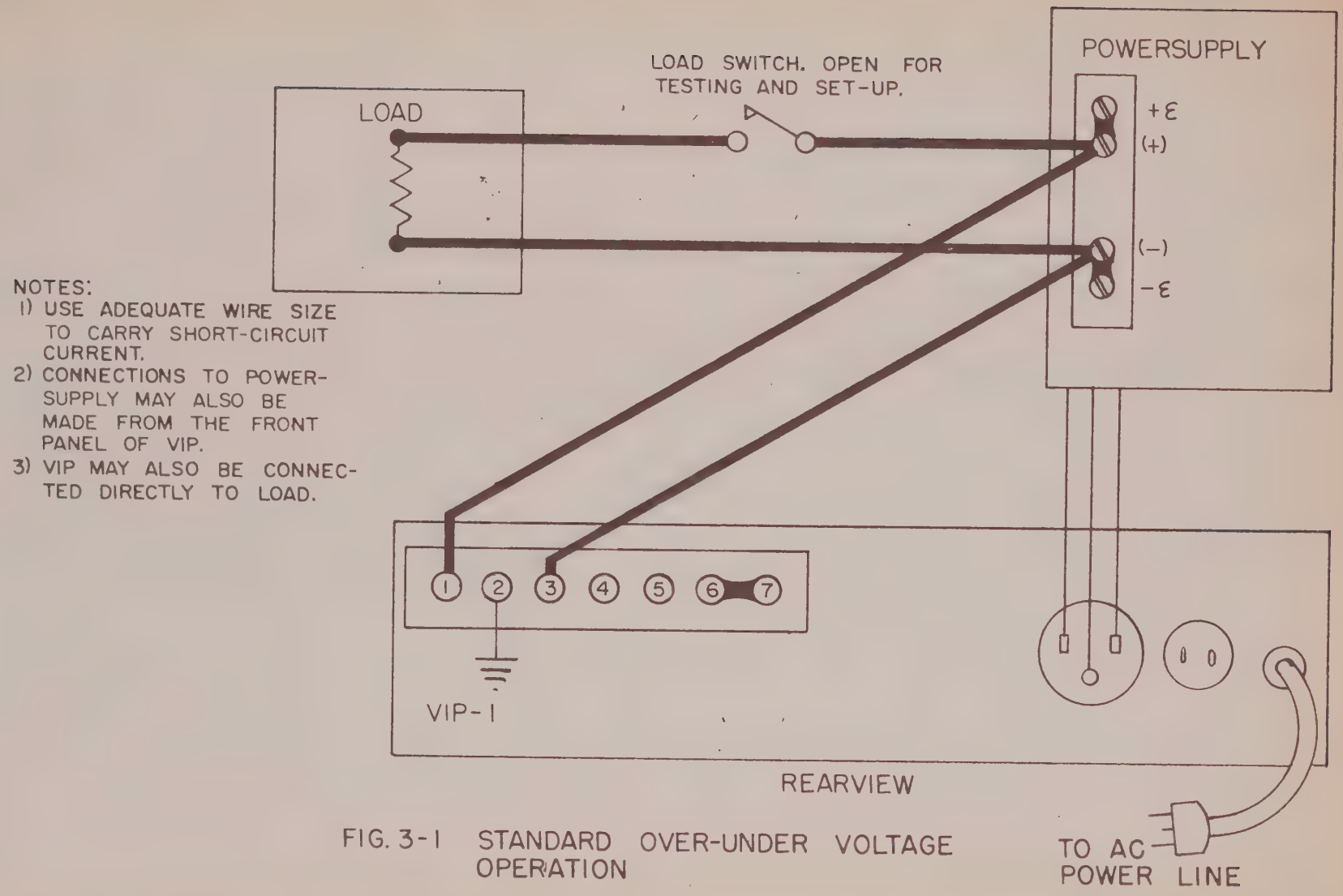
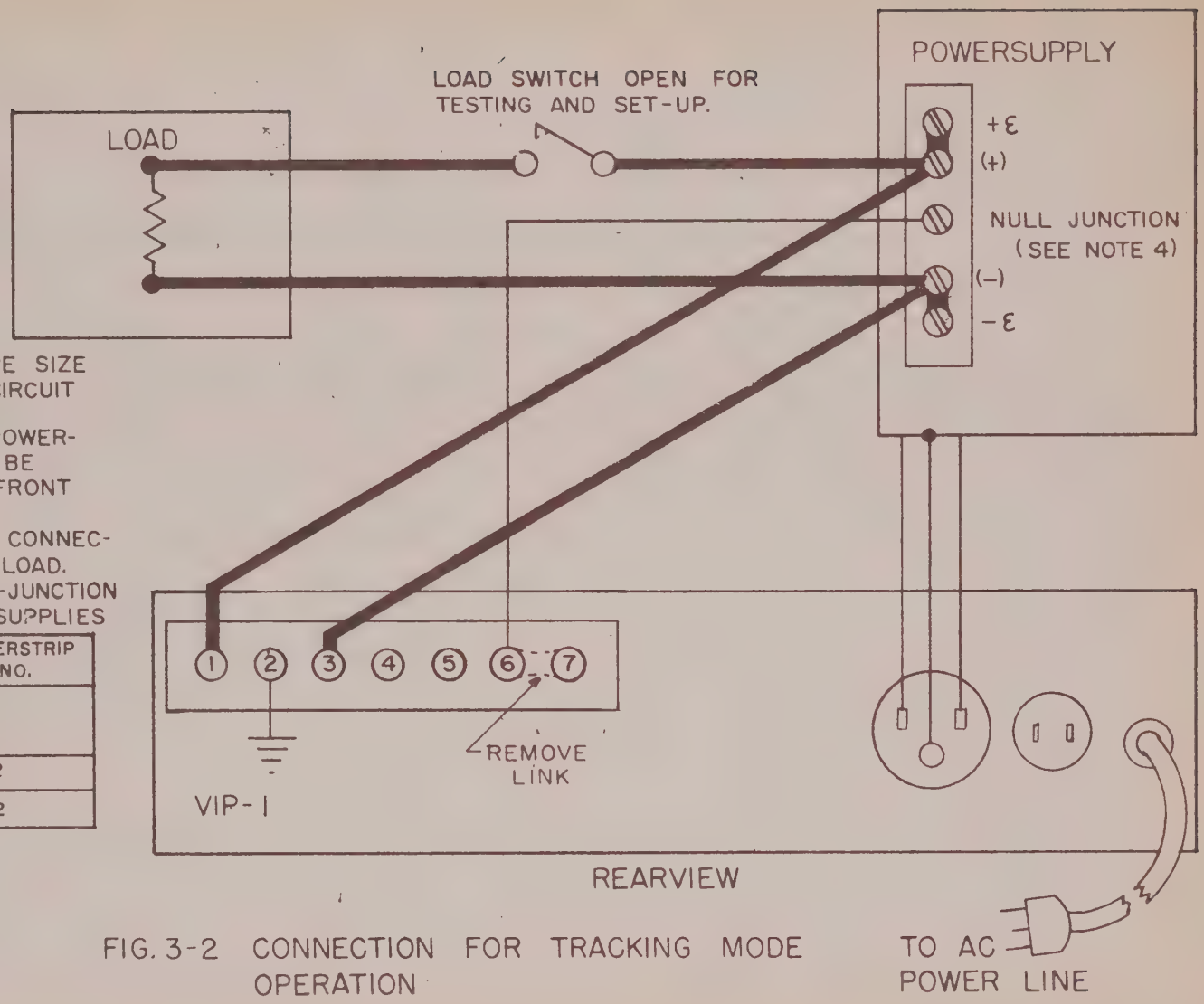


FIG. 3-1 STANDARD OVER-UNDER VOLTAGE OPERATION



NOTES:
1) USE ADEQUATE WIRE SIZE TO CARRY SHORT-CIRCUIT CURRENT.
2) CONNECTIONS TO POWER-SUPPLY MAY ALSO BE MADE FROM THE FRONT PANEL OF VIP.
3) VIP MAY ALSO BE CONNECTED DIRECTLY TO LOAD.
4) LOCATION OF NULL-JUNCTION FOR KEPCO POWERSUPPLIES

MODEL	REAR-BARRIERSTRIP TERMINAL NO.
ABC(ALLTRANSISTOR)	9
CK	12
KS	12

FIG. 3-2 CONNECTION FOR TRACKING MODE OPERATION

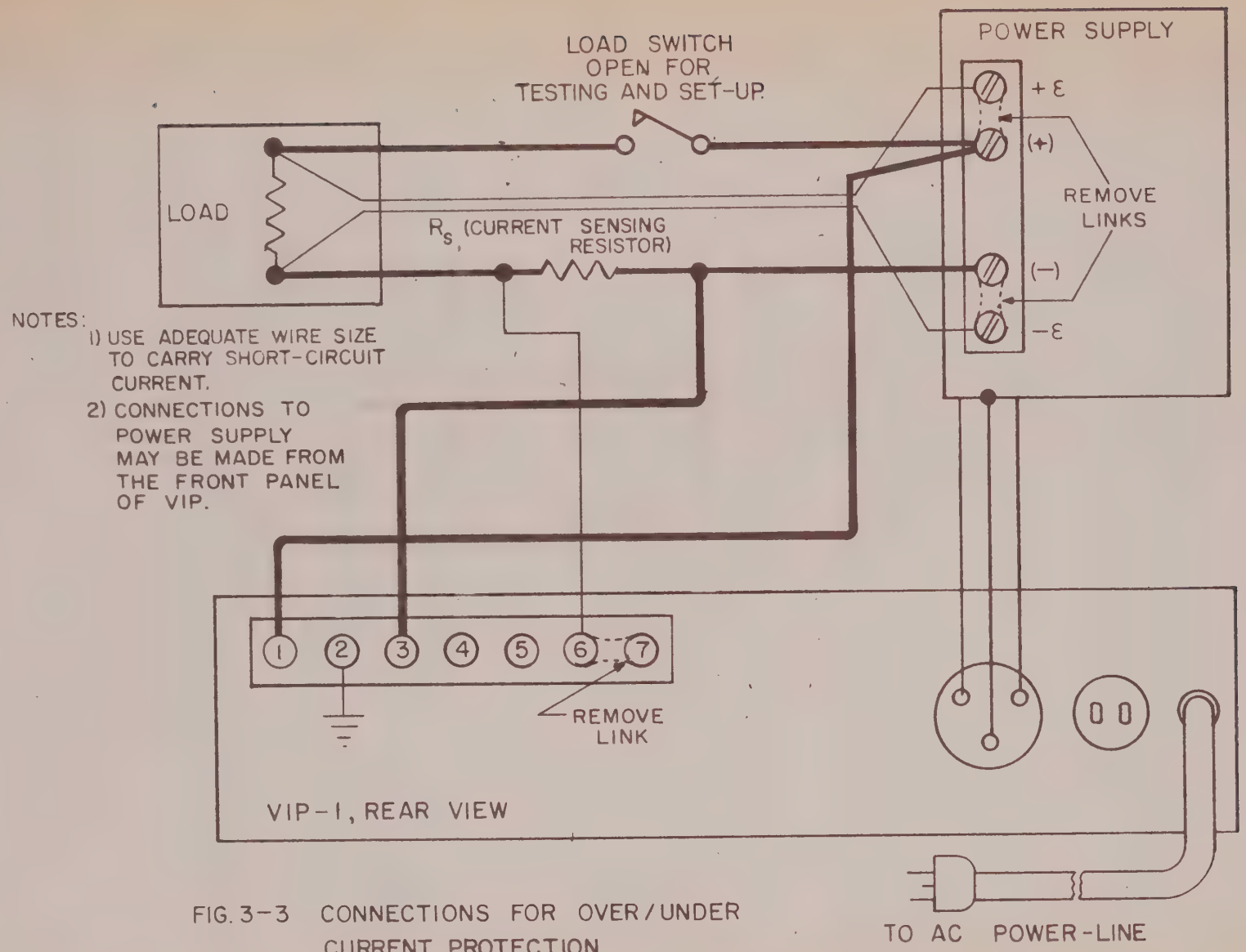


FIG. 3-3 CONNECTIONS FOR OVER/UNDER CURRENT PROTECTION.

SECTION IV - CIRCUIT DESCRIPTION

4-1 GENERAL

4-2 This section describes the major circuitry of the Kepco Model VIP-1 OVERVOLTAGE/OVERCURRENT PROTECTOR. The purpose of the analysis is to provide the user with a functional understanding of the equipment, thus forming a basis for successful operation and maintenance.

4-3 AC INPUT CIRCUIT (Refer to Main Schematic, FIG. 5-3)

4-4 AC line power is introduced through a heavy duty, three wire line cord with polarized plug. When line power switch S101 is closed, line power is applied to main transformer T1. As the secondary voltage builds up, relay K201 is energized through C9 and held by its own holding contacts (1) and (3). The power supply outlet J202 as well as the "Operate" pilot light DS101 are energized.

4-5 MAIN DC SUPPLIES. (Refer to Main Schematic, FIG. 5-3)

4-6 The operating voltages for the amplifier circuit and the control bridge circuit are derived from the secondary winding on T1. Two full wave rectifier circuits consisting of CR1 through CR4 and two capacitor/resisto filters (C1, C2, R1, R4, C3 and C4) provide the DC operating voltages, which are zener regulated by CR5 and CR6.

4-7 BRIDGE SENSING CIRCUIT (Refer to FIG. 4-1)

4-8 In the standard over voltage operating mode, use is made of a voltage comparison bridge circuit. This bridge is formed by the voltage drop across R13 (V_r), by R14 and R17 (R_r), by the 'coarse' and 'fine' voltage control resistors (R_{vc}), and the output voltage of the power supply to which the VIP-1 is connected (E_{in}). A condition of balance exists when $\frac{V_r}{R_r} = \frac{E_{in}}{R_{vc}}$. In this case the error voltage between points A and A' is virtually zero. The balance is upset however as soon as there is a change in E_{in}. The unbalance appears as an error signal at the input to the differential amplifier stage. The error signal will be amplified and directed to the gate of the crow-baring S.C.R.

4-9 AMPLIFIER AND CROWBAR CIRCUITRY (Refer to Main Schematic, FIG. 5-3)

4-10 The input circuitry of the VIP-1 is comprised of the differnetial input pair Q1 and Q2 and equipped with an offset control (R101), brought out to the front panel (SENSITIVITY). While the offset control is connected to the base of Q1, the base of Q2 is connected to the null junction of the sensing bridge. An error signal, larger than the pre-set offset (SENSITIVITY) will be amplified and transfered to the following differential amplifier pair (Q3 and Q4). From the collector of Q4, the amplified signal goes directly to the gate of the crow-bar S.C.R. (CR9). CR9 when fired, places a short circuit across the front and rear output terminals. In series with the short circuit are only current limiting resistors R103 through R107 and CR11. The resistors are proportional to the setting of the OPERATING VOLTAGE 'COARSE' switch on the front panel and serve to limit the short circuit-current through CR9.

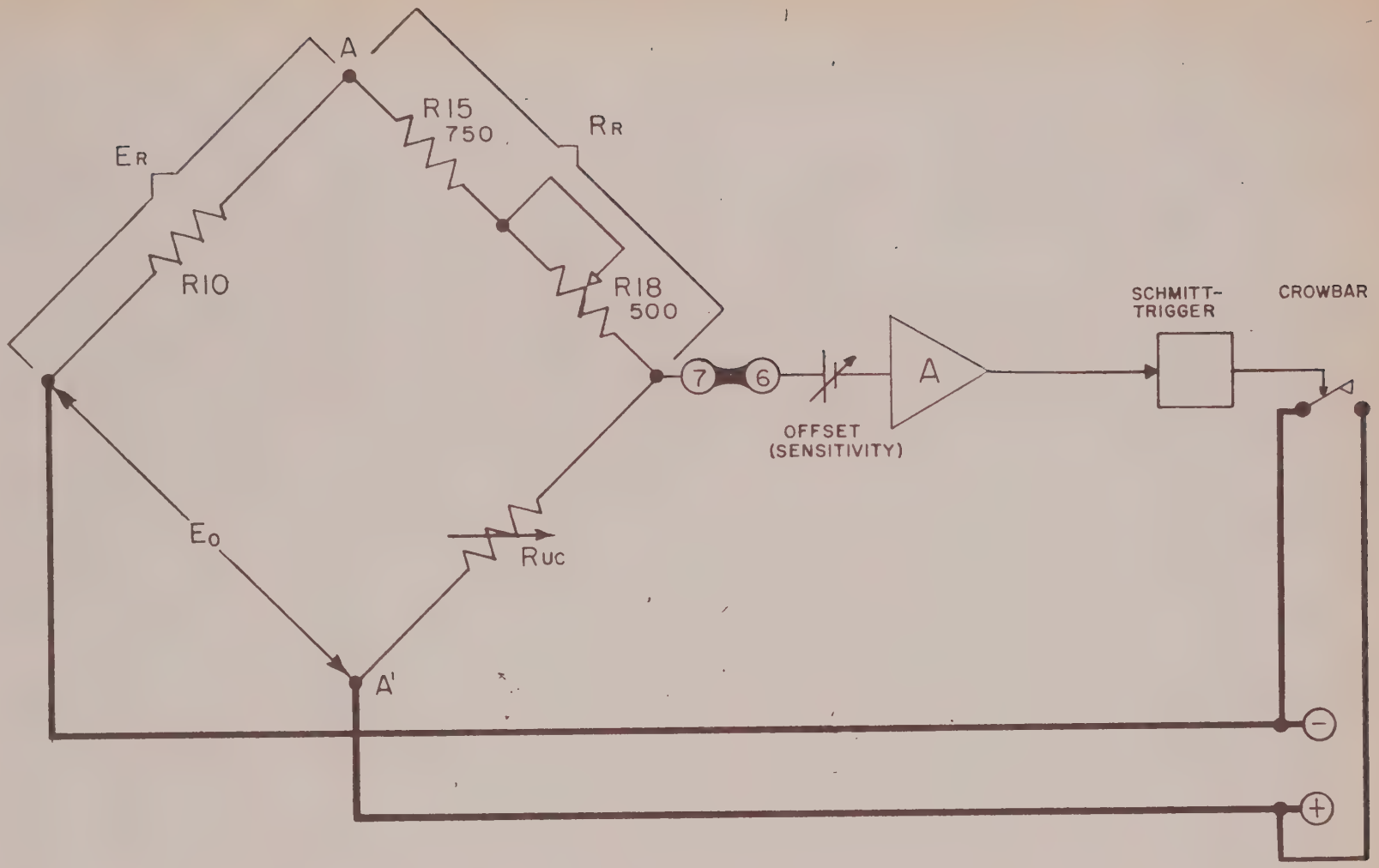


FIG. 4-1 SIMPLIFIED BLOCK DIAGRAM AND BRIDGE CIRCUIT, VIP-1

5-1 GENERAL

5-2 This section contains information for the maintenance, internal adjustments and trouble shooting of the KEPCO Model VIP-1 OVER VOLTAGE/OVERCURRENT PROTECTOR. Functional tests are described in conjunction with the operational procedures in Section III.

5-3 PRECAUTIONS

5-4 No parts in this device should be replaced with substitutes not adjustments and trouble shooting of the KEPCO Model VIP-1 OVER VOLTAGE/OVERCURRENT PROTECTOR. Functional tests are described in conjunction with the operational procedures in Section III.

5-5 TEST EQUIPMENT REQUIRED

5-6 The following is a list of test equipment required to test and adjust the Model VIP-1.

a) Variable transformer capable of adjusting the power line from either 105 to 125 V AC or 210 to 250 V AC, to test the Model VIP-1 over its specified input range.

b) Power supply, feedback regulated, output voltage range 0 to 200 volts KEPCO Model SM 325-0.5 or its equivalent. (Two are required if the VIP-1 is to be tested in the Overcurrent mode of operation.

c) Voltage Monitor, differential or digital voltmeter with a resolution of at least 10 mV and a range covering the maximum operating range of the Model VIP-1. DIGITEC Model 201 or its equivalent.

d) Multimeter, Weston Analyzer, Model 980 or its equivalent, for general trouble-shooting and voltage measurements.

5-7 INTERNAL BRIDGE CURRENT ADJUSTMENT

5-8 The internal adjustment for the comparison bridge current if factory adjusted to a value that allows the Model VIP-1 to accomodate power supplies up to and including 200 volts output voltage with the OPERATING VOLTAGE 'COARSE' and 'FINE' controls on the front panel turned completely clockwise. The adjustment of the intermal bridge current control is necessary only following the control's or its associate components' replacement.

5-9 PROCEDURE

a) Connect power supply and digital or differential voltmeter across the rear terminals on the VIP-1 (1) and (3). Set SENSITIVITY and both, OPERATING VOLTAGE "COARSE" and "FINE" controls to their maximum clockwise positions.

b) Turn the Model VIP-1 on first. Turn on power supply and set to exactly 205 volts output.

c) If the Model VIP-1 has triggered while the power supply was advanced to 205 volts turn R17 (Refer to FIG. 5-2 for location) counter clockwise and repeat paragraph 5-9B.

d) If Model VIP-1 does not trigger when reaching 205 volts on the power supply, adjust R17 clockwise until triggering just occurs as indicated by the lighting of the red FAULT light. This concludes the adjustment

5-10 TROUBLE SHOOTING

5-11 Modern solid state devices require thorough understanding of the problems involved in repairing complex feedback circuitry. Servicing beyond simple part replacements should consequently be attempted only by personnel thoroughly familiar with solid state component techniques and experienced in closed loop circuitry.

5-12 "Trouble shooting charts", showing resistance and voltage readings on various parts of the circuitry are of very limited usefulness with feedback amplifiers and are not included here. Presented instead are a detailed circuit description (Section IV), parts location diagrams (FIG'S. 5-1 and 5-2) and the main schematic (FIG. 5-3) with all significant voltage readings.

5-13 The following basic steps in case of a malfunction may be found useful:

a) Device does not function at all: Check all power line connections and make certain that fuses are intact and device if connected to the correct line voltage. (It is normally delivered for 115 V AC operation, if not specified otherwise).

b) If device shows spurious triggering, investigate the ground connections of both, the VIP-1 and the power supply. As indicated in all operational set-up diagrams in Section III, the ground connection should be common to both instruments, as short as possible, and returned to a solid AC ground.

c) A large percentage of field-failures is due to incorrect external connections. Check all external set-ups against the diagrams provided in Section III.

d) Only after points A through C above have been thoroughly covered should an internal analysis begin. The transistors should be checked on a reliable transistor checker. The voltage readings are taken with the VIP-1 and the connected power supply in equilibrium.

e) KEPCO Field Engineering Offices or the KEPCO Repair Department will be available for consultation or direct help in difficult service or application problems.

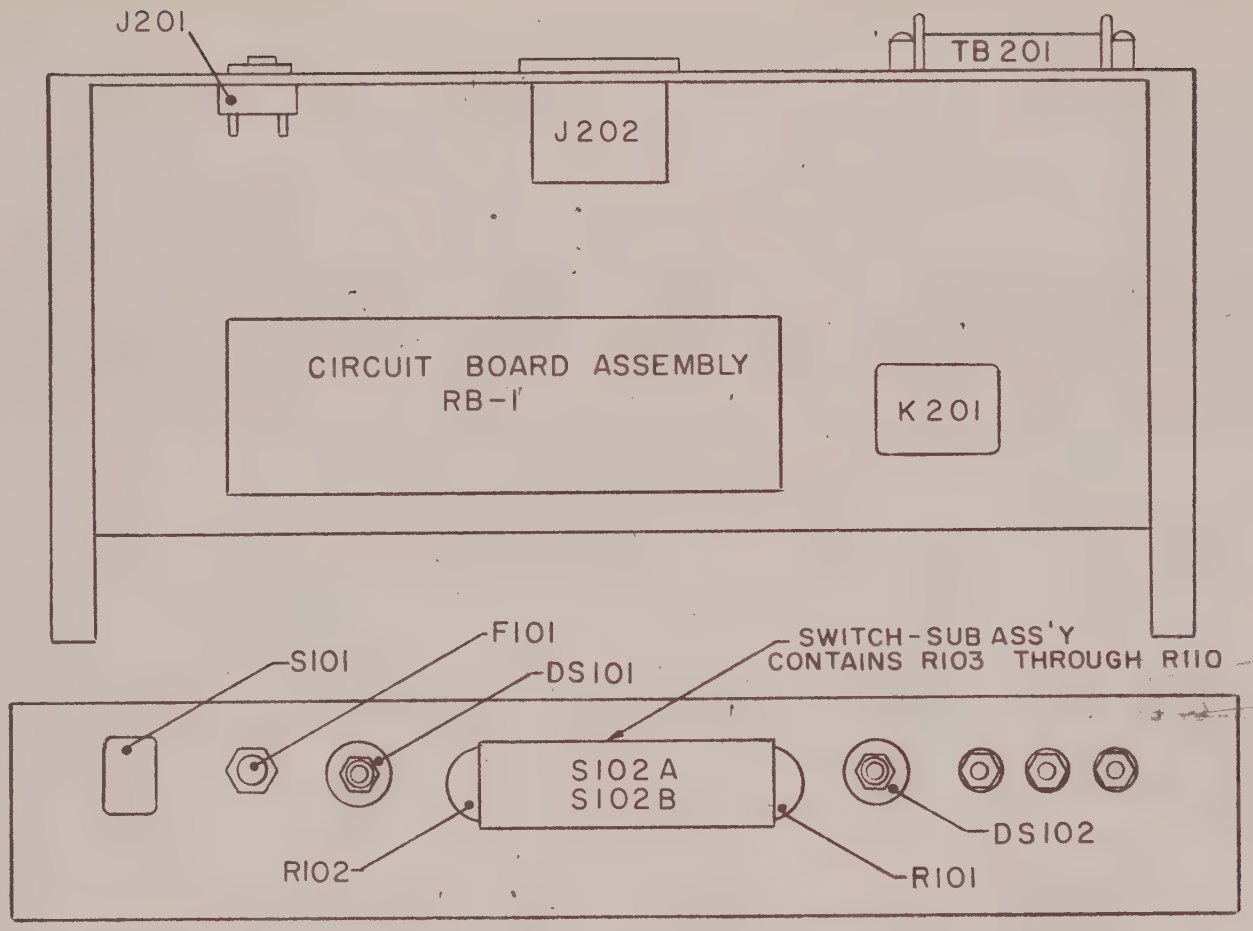


FIG. 5-1 COMPONENT LOCATION (MAIN CHASSIS)

kepco® REPLACEMENT PARTS LIST

MODEL VIP-1 OVERVOLTAGE/OVERCURRENT PROTECTOR Code 2-268

SCHEMATIC NO.	QTY.	DESCRIPTION	MFRS. NAME & PART NO. (See Note)	KEPCO PART NO.
CIRCUIT BOARD (RB-1) ASSEMBLY INCLUDES:				
C1,2	2	Capacitor, Electrolytic, Pigtail 50 µF, 150 V	Industrial Cond. 10B936	117-0127
C3,4	2	Capacitor, Electrolytic, Pigtail 100 µF, 50 V	Industrial Cond. 1B1070	117-0122
C6,8	2	Capacitor, Mylar, Pigtail 2 µF, 200 V, 10%	TRW Type X663F	117-0129
C7	1	Capacitor, Mylar 0.05 µF, 200 V, 20%	TRW Type X663F	117-0315
C9	1	Capacitor, Electrolytic, Pigtail 60 µF, 200 V	Sprague Electric 38D606F200G12	117-0655
CR1,2, 3,4,10	5	Rectifier, Silicon, Pigtail	Semicon Inc. SM-140	124-0028
CR5,6	2	Zener Diode	Transitron SV125	121-0028
CR7,8	2	Rectifier, Silicon, Pigtail	Semicon Inc. SM-110	124-0133
CR9	1	Rectifier, Silicon, Control	General Electric C30B	124-0268
CR11	1	Rectifier, Silicon, Stud Type	Motorola 1N3210R	124-0166
Q1,2,3	3	Transistor, Silicon, NPN	General Electric 2N336A	119-0056
Q4	1	Transistor, Silicon, PNP	Hughes 2N1131A	119-0055
R1,4,15	3	Resistor, Fixed, Power, Axial 2 K ohm, 5 W, 5%	Ward Leonard 5X2000	115-0568
R2,5	2	Resistor, Fixed, Power, Axial 1 K ohm, 3 W, 5%	Tepro TS3C	115-1302
R3,12	2	Resistor, Fixed, Power, Axial 500 ohm, 3 W, 5%	Ward Leonard 3X500	115-0459
R6	1	Resistor, Fixed, Molded 1.5 K ohm, 1/2 W, 10%	Allen Bradley EB1521	115-0578
R7	1	Resistor, Fixed, Molded 3.3 K ohm, 1/2 W, 10%	Allen Bradley EB3321	115-0439
R8	1	Resistor, Fixed, Molded 5.6 K ohm, 1/2 W, 5%	Allen Bradley EB5625	115-0559
R9,10	2	Resistor, Fixed, Molded 1 K ohm, 1/2 W, 10%	Allen Bradley EB1021	115-0547
R11	1	Resistor, Fixed, Molded 4.7 K ohm, 1/2 W, 10%	Allen Bradley EB4721	115-0467

REPLACEMENT PARTS MAY BE ORDERED FROM KEPCO INC. ORDERS SHOULD INCLUDE KEPCO PART NUMBER AND DESCRIPTION.

PLEASE NOTE: THE MANUFACTURER'S NAME AND PART NUMBER LISTED IN THE ITEM DESCRIPTION FOR REPLACEMENT PARTS IS THE REPRESENTATIVE AT LEAST ONE SOURCE FOR THAT ITEM AND IS LISTED SOLELY FOR THE CONVENIENCE OF KEPCO EQUIPMENT OWNERS IN OBTAIN THE REPLACEMENT PARTS. WE DO NOT RECOMMEND THE PRODUCTS OF ANY MANUFACTURER OVER ANY OTHER.

MODEL VIP-1 OVERVOLTAGE/OVERCURRENT PROTECTOR Code 6-865

SCHEMATIC NO.	QTY.	DESCRIPTION	MFRS. NAME & PART NO. (See Note)	KEPCO PART NO.
R13	1	Resistor, Fixed, Power, Axial 100 ohm, 3 W, 5%	Ward Leonard 3X100	115-0471
R14	1	Resistor, Fixed, Power, Axial 600 ohm, 3 W, 5%	Hardwick Hindle 9/16 GA 600 LTC	115-0862
R16	1	Resistor, Fixed, Molded 22 K ohm, 1 W, 10%	Allen Bradley GB2231	115-0012
R17	1	Resistor, Variable, Multiturn 500 ohm, 0.25 W, 10%	Bourns 271-1-501 Trimit	115-0663
T1	1	Transformer, Power	Kepco Magnetics	100-1346A
FRONT PANEL ASSEMBLY INCLUDES:				
DS101, 102	2	Pilot Light, Neon	General Electric NE-51	153-0024
F101	1	Fuse, Instantaneous 1/2 amp, 250 V	Bussman AGC-1/2	141-0002
R101	1	Resistor, Variable, WW 100 ohm, 4 W, 5%	Clarostat A10-100	115-0425
R102	1	Resistor, Variable, Multiturn 65 K ohm, 3 W, 3%	Bourns 3507S-319-653	115-1325
R103, 104	2	Resistor, Fixed, Power, Axial 0.5 ohm, 5 W, 5%	Ward Leonard 7/8"X0.5	115-0781
R105, 106, 107	3	Resistor, Fixed, Power, Axial 0.25 ohm, 5 W, 5%	Hardwick Hindle Type 1WA	115-1174
R108, 109, 110	3	Resistor, Fixed, Precision 50 K ohm, 1 W, 1%	Wilrite Products CMC-1	115-0297
S101	1	Switch, Toggle, SPST 15 A, 125 V	Carling Electric AA252-63XDEP2	127-0107
S102	1	Switch, Rotary 2 Pole, 4 Position	Ohmite Mfg. 111-4-T2	127-0158
MAIN CHASSIS ASSEMBLY INCLUDES:				
K201	1	Relay 3PDT, 115 V	Omega 200PC3CX	140-0040

REPLACEMENT PARTS MAY BE ORDERED FROM KEPCO, INC. ORDERS SHOULD INCLUDE KEPCO PART NUMBER AND DESCRIPTION.

PLEASE NOTE: THE MANUFACTURER'S NAME AND PART NUMBER LISTED FOR EACH ITEM ON REPLACEMENT PARTS LISTS, REPRESENTS AT LEAST ONE SOURCE FOR THAT ITEM AND IS LISTED SOLELY FOR THE CONVENIENCE OF KEPCO EQUIPMENT OWNERS IN OBTAINING REPLACEMENT PARTS LOCALLY. WE RESERVE THE RIGHT TO USE EQUIVALENT ITEMS FROM ALTERNATE SOURCES KEPCO, INC

B M06363

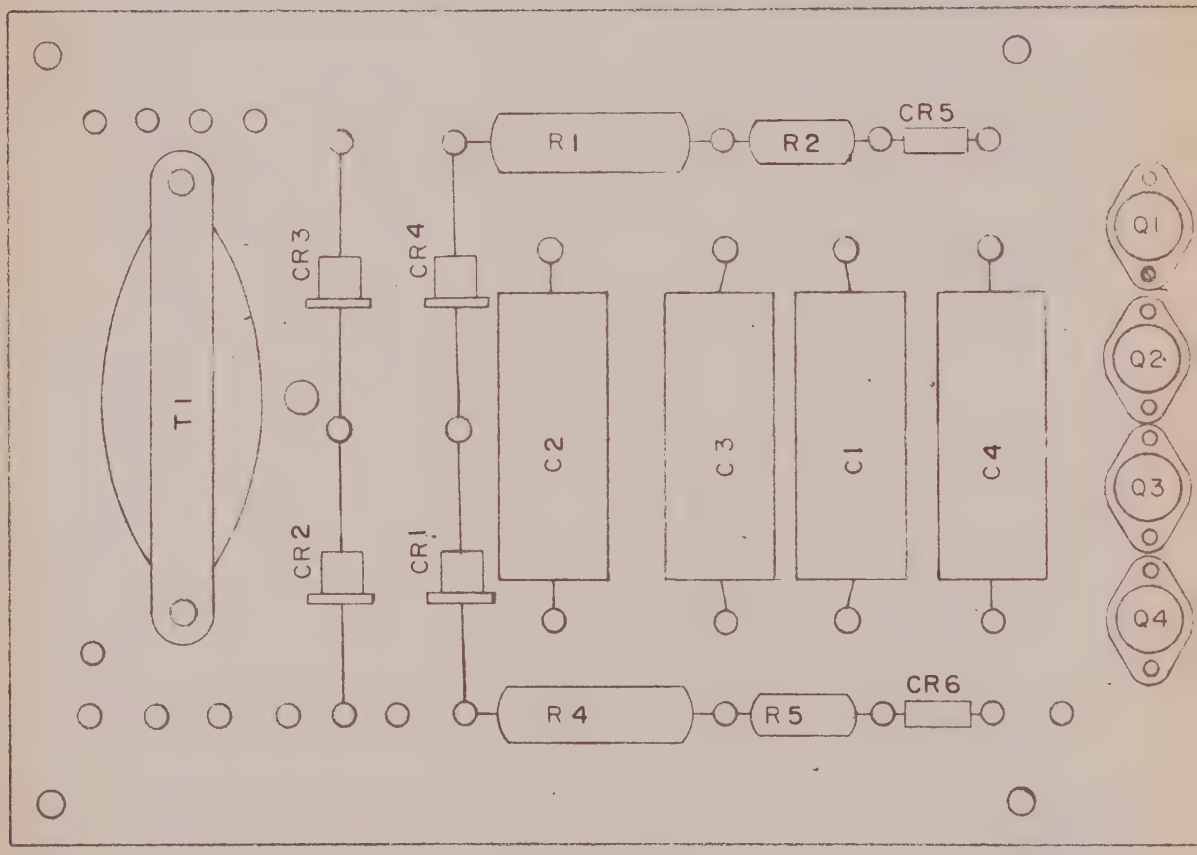
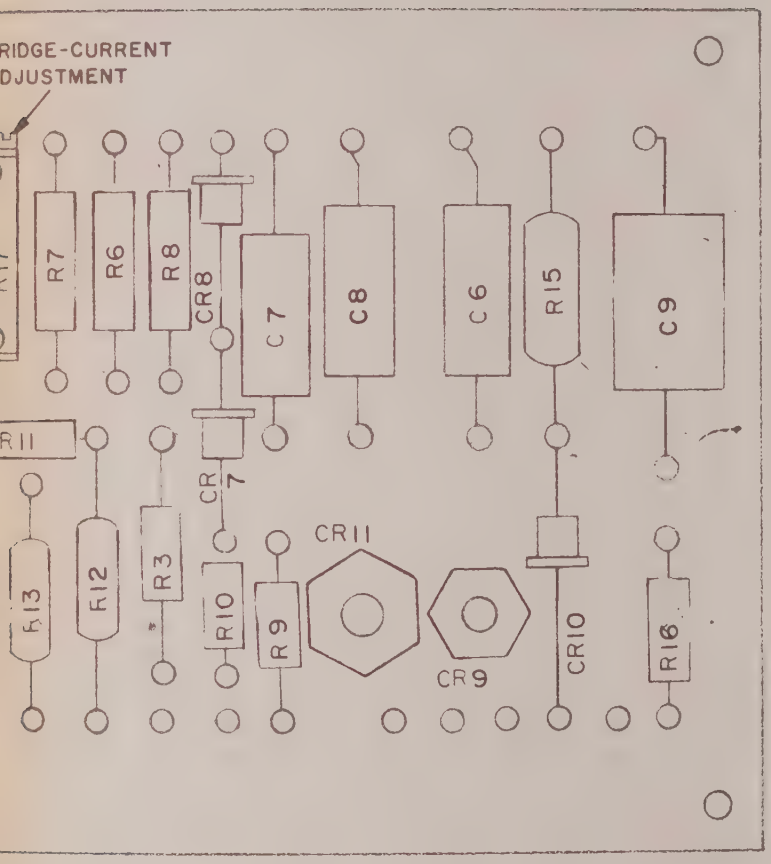


FIG. 5-2

REVISIONS	DRAWN	CHKD.	APPD	DATE

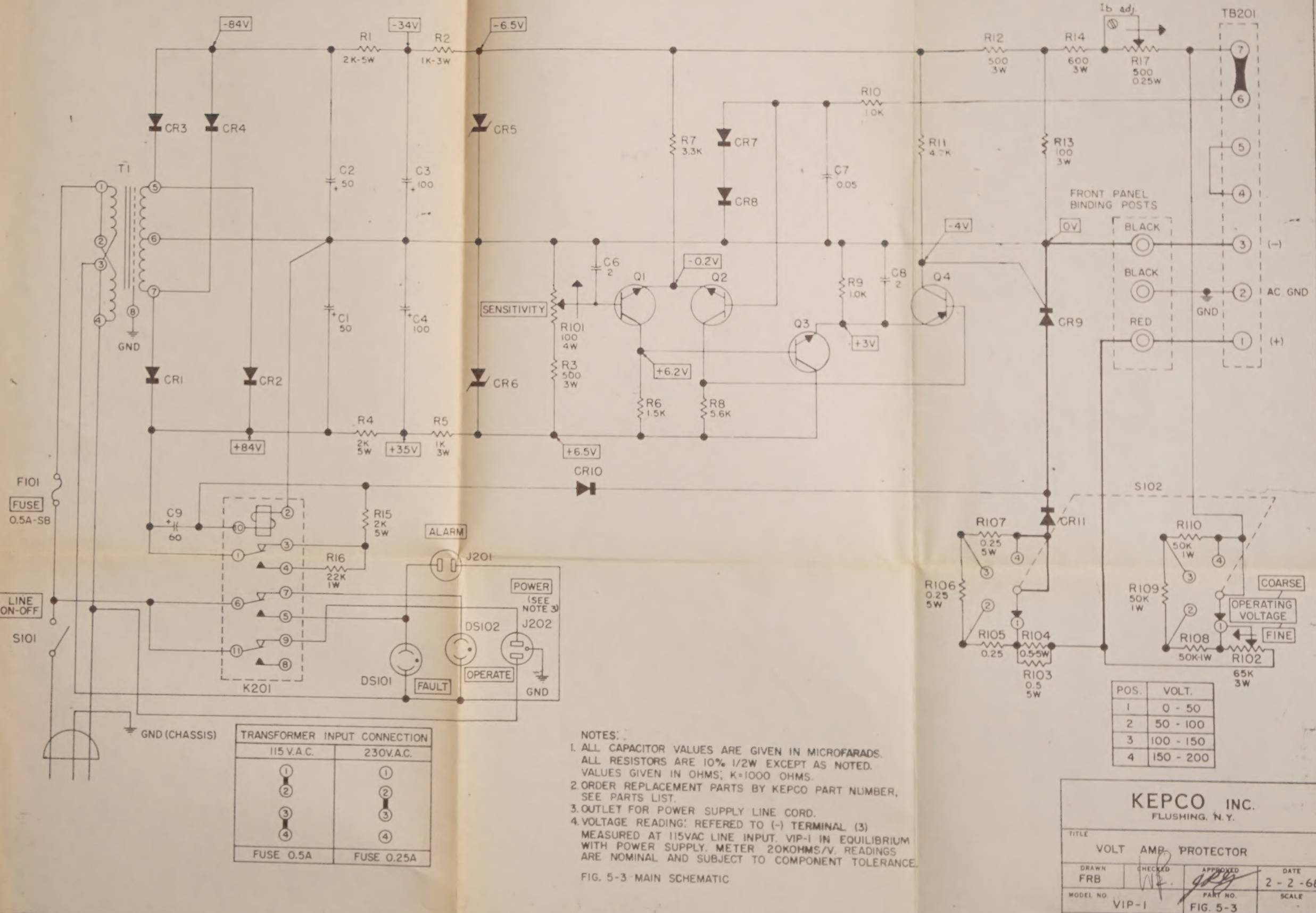


KEPCO INC.

FLUSHING, N.Y.

TITLE	COMPONENT LOCATION RBI		
DRAWN FRE	CHECKED	APPROVED	DATE 11-14-66
MODEL NO. VIP-1		PART NO. --	SCALE
DWG. NO. B M06363			

REVISIONS	DRAWN	CHKD.	APPD	DATE



TRANSFORMER INPUT CONNECTION	
115 V.A.C.	230V.A.C.
① ② ③ ④	① ② ③ ④
FUSE 0.5A	FUSE 0.25A

POS.	VOLT.
1	0 - 50
2	50 - 100
3	100 - 150
4	150 - 200

NOTES:
1. ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS. ALL RESISTORS ARE 10% 1/2W EXCEPT AS NOTED. VALUES GIVEN IN OHMS; K=1000 OHMS.
2. ORDER REPLACEMENT PARTS BY KEPCO PART NUMBER, SEE PARTS LIST.
3. OUTLET FOR POWER SUPPLY LINE CORD.
4. VOLTAGE READING: REFERED TO (-) TERMINAL (3) MEASURED AT 115VAC LINE INPUT. VIP-1 IN EQUILIBRIUM WITH POWER SUPPLY. METER 20KOHMS/V. READINGS ARE NOMINAL AND SUBJECT TO COMPONENT TOLERANCE.

FIG. 5-3 MAIN SCHEMATIC

TOLERANCE UNLESS OTHERWISE SPECIFIED FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2

KEPCO INC.
FLUSHING, N.Y.

TITLE			
VOLT AMP. PROTECTOR			
DRAWN	CHECKED	APPROVED	DATE
FRB			2 - 2 - 68
MODEL NO.		PART NO.	SCALE
VIP-1		FIG. 5-3	
DWG. NO. C M02122			

KEPCO, INC. • 131-38 SANFORD AVENUE • FLUSHING, N.Y. 11352 • (212) 461-7000 • TWX #710-582-2631 • Cable: KEPCOPOWER NEWYORK